AD-A115 661 WEATHER SQUADRON (30TH) APO SAN FRANCISCO 96301 F/G 4/2
TERMINAL FORECAST REFERENCE NOTEBOOK, DETACHMENT 8, FIRST WEATH--ETC(U)
JUL 81
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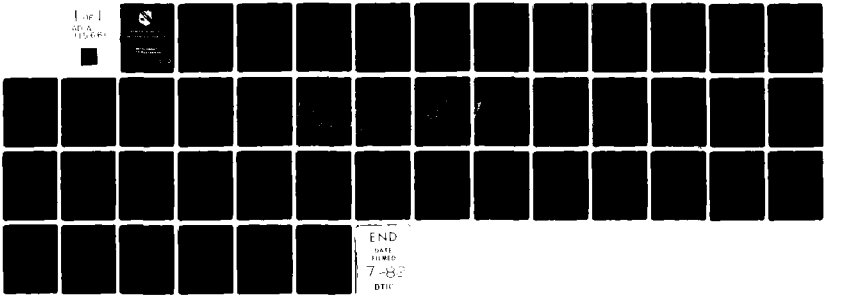

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TERMINAL FORECAST REFERENCE NOTEBOOK

DETACHMENT 8
30TH WEATHER SQ

Preparation Date: 21 July 1981

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This publication provides weather forecasting guidelines for Kadena AB, Okinawa (Japan). The types of information contained are: climatology, topography, typhoon worksheets, data availability, location of meteorological instruments, and weather impact on supported units.

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TERMINAL FORECAST REFERENCE NOTEBOOK

TABLE OF CONTENTS

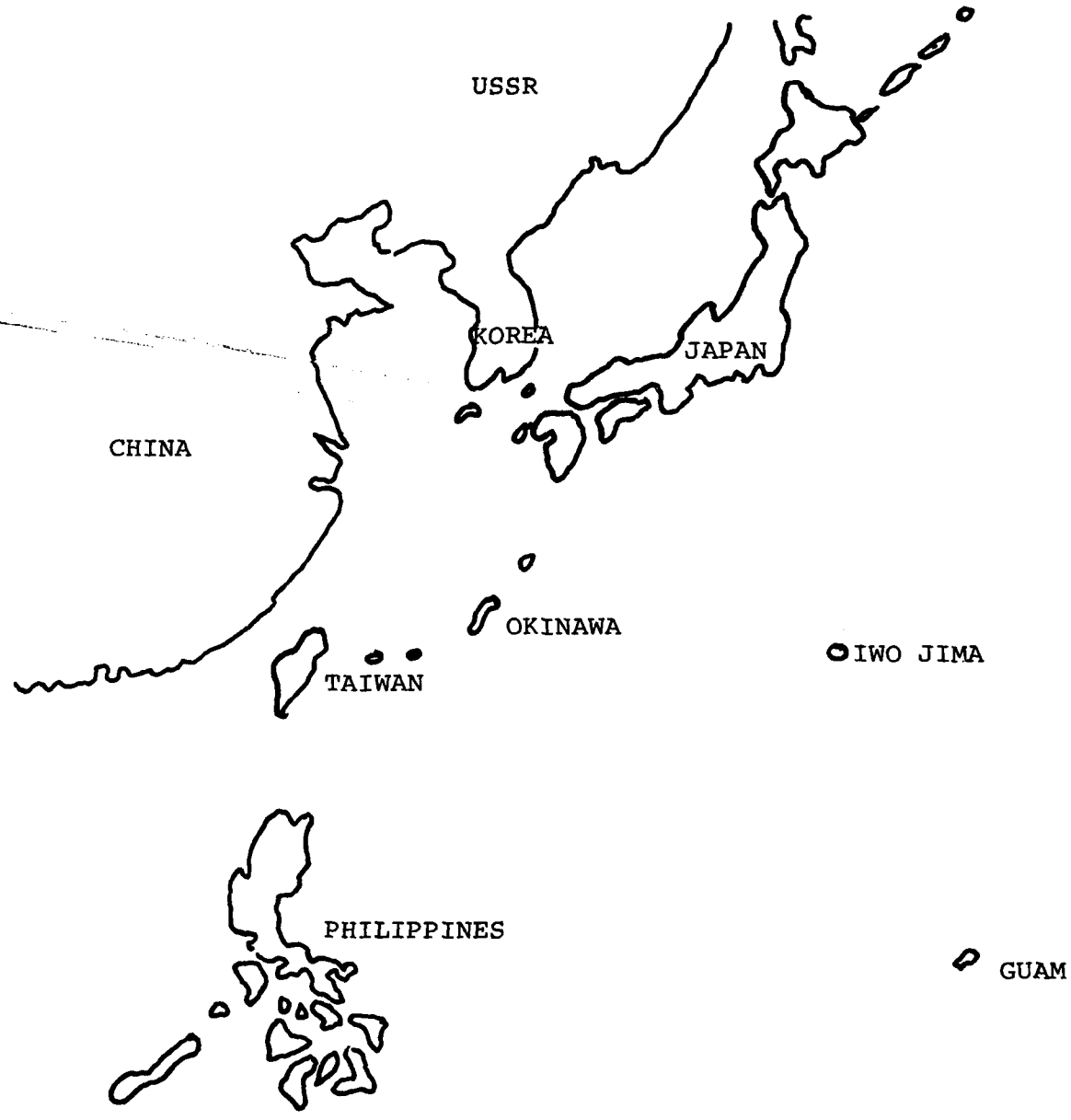
"Original contains color plates: All DTIC reproductions will be in black and white"

SECTION A

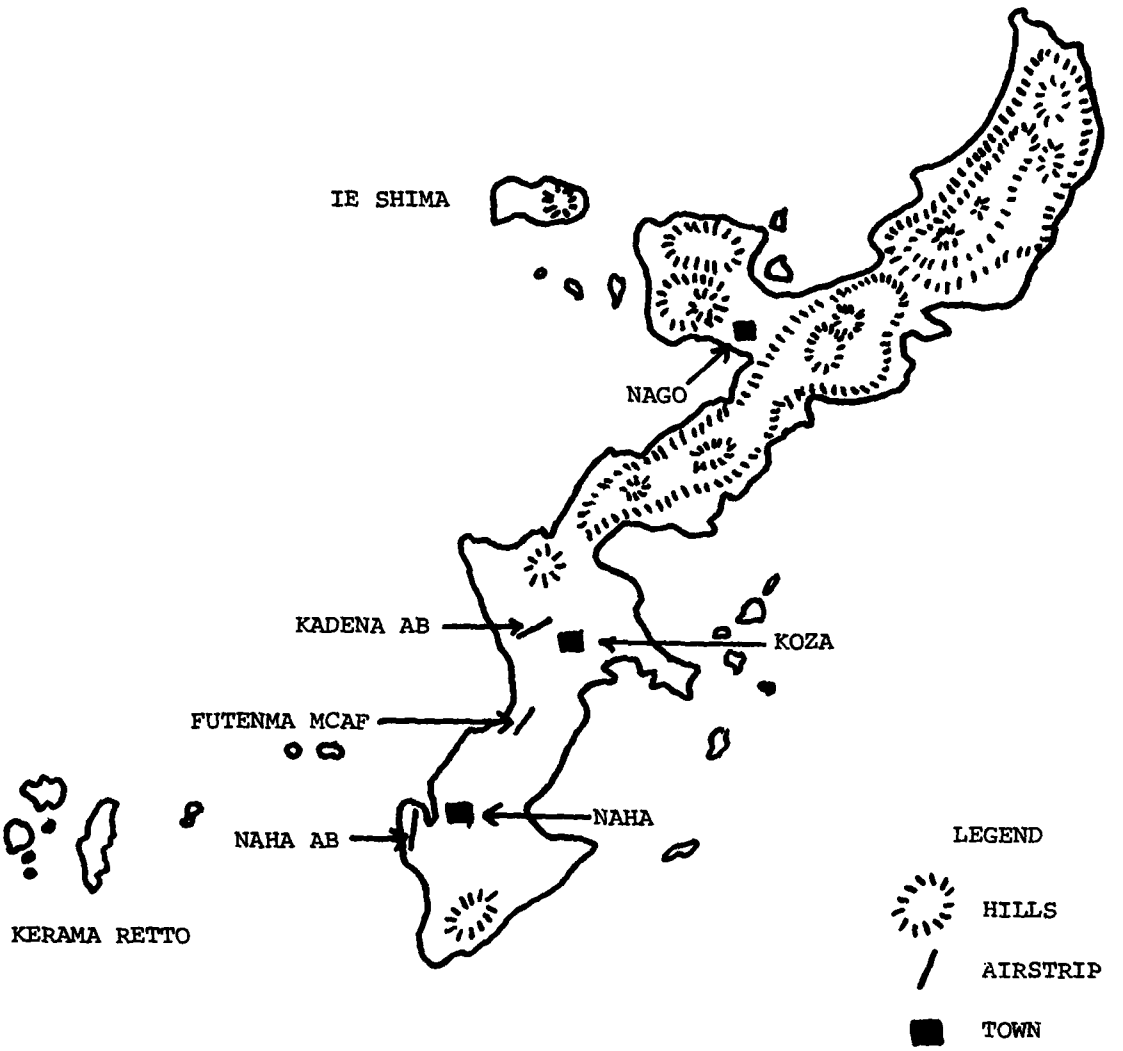
LOCATION, TOPOGRAPHY, AND LOCAL EFFECTS

SECTION A

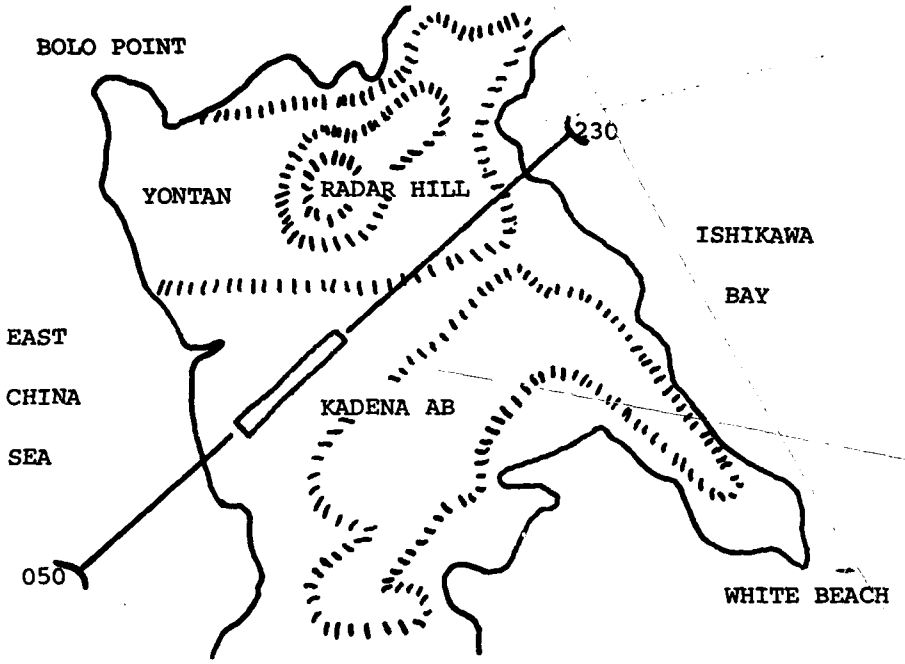
LOCATION, TOPOGRAPHY, AND LOCAL EFFECTS



1. Kadena AB is on the island of Okinawa, the largest island in the Ryukyus chain. The Ryukyus extend southwestward from Kyushu to Taiwan, forming the boundary between the Pacific Ocean and East China Sea.



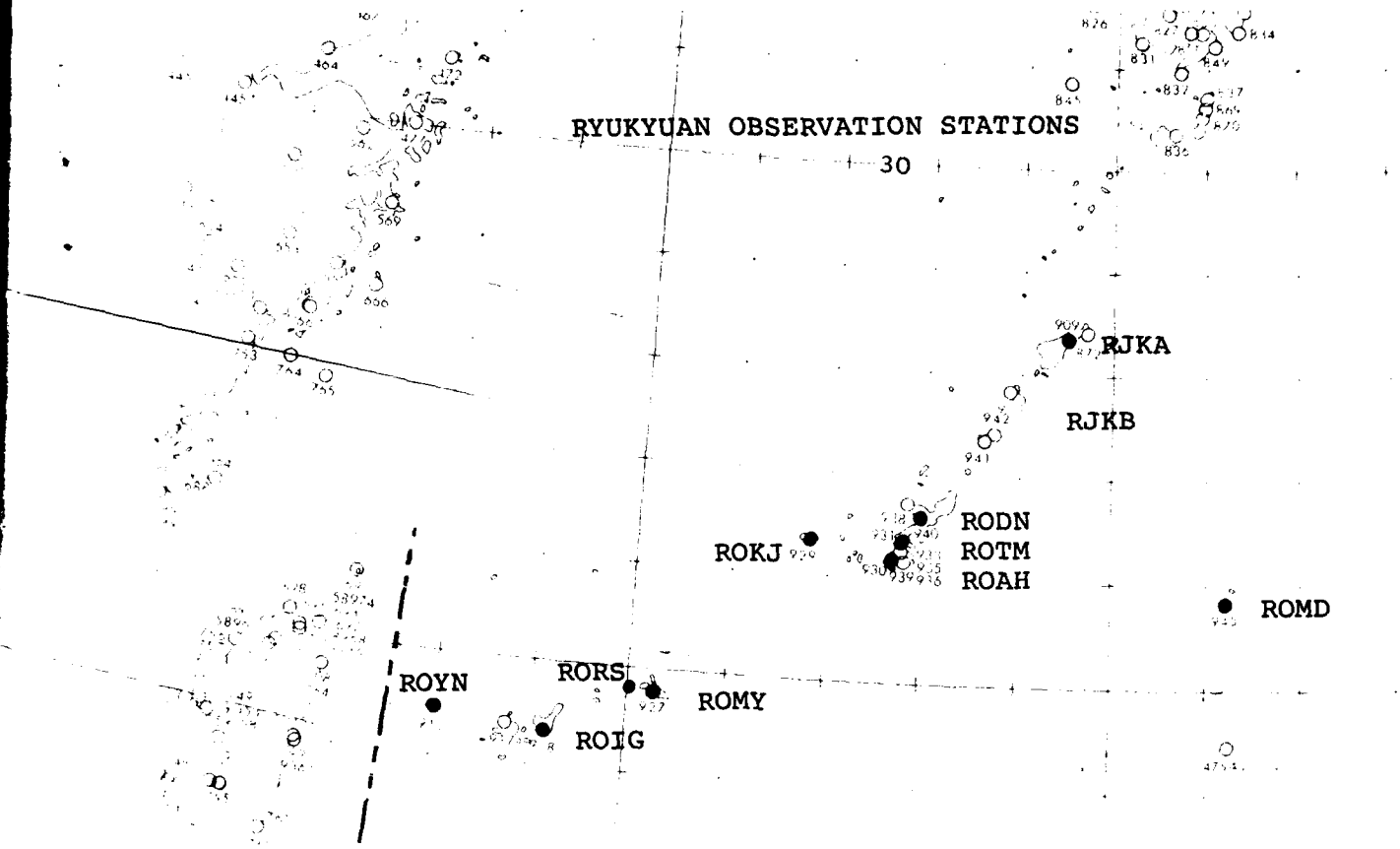
2. The island of Okinawa is approximately 65 miles long and ranges from 2 to 15 miles wide. The northern two-thirds of the island consists of rugged hilly terrain. The average height of the hills is less than 1500 feet. The southern third of the island is less rugged, consisting of coral escaspment and small rolling hills. There are numerous small islands and coral reefs around the main island. Some of these, such as Ie Shima and the Kerama islands, are large enough to support small farming or fishing communities. The remainder are uninhabited.



3. Kadena Air Base, at 26 21'N 127 46'E and at a field elevation of 146 feet, is located just south of the central ridge of hills of northern Okinawa. There is a small plateau north-northwest of the base. "Radar hill", elevation 734 feet, is just to the north and Naha AB is visible to the south of the base. The East China Sea is just west of Kadena and the southwest runway approach (050) is over water. The approach from the northeast (230) is over four miles of small hills (under 300 feet) and farms. The base proper is 100 to 200 feet higher than the runway.

a. A Basic Weather Watch is conducted from the base weather station (BWS) at Kadena AB. At ground level, buildings obstruct 75 percent of the horizon leaving only the west through west-northwest area visible. Observers must climb three flights of stairs to view the entire horizon. Observations from this vantage point are fairly representative.

b. The weather and climatology of Ie Shima, a small island 26 miles northwest of the main island, are essentially the same as Kadena AB. The discussions and guidelines contained in this TFRN are also applicable to Ie Shima.



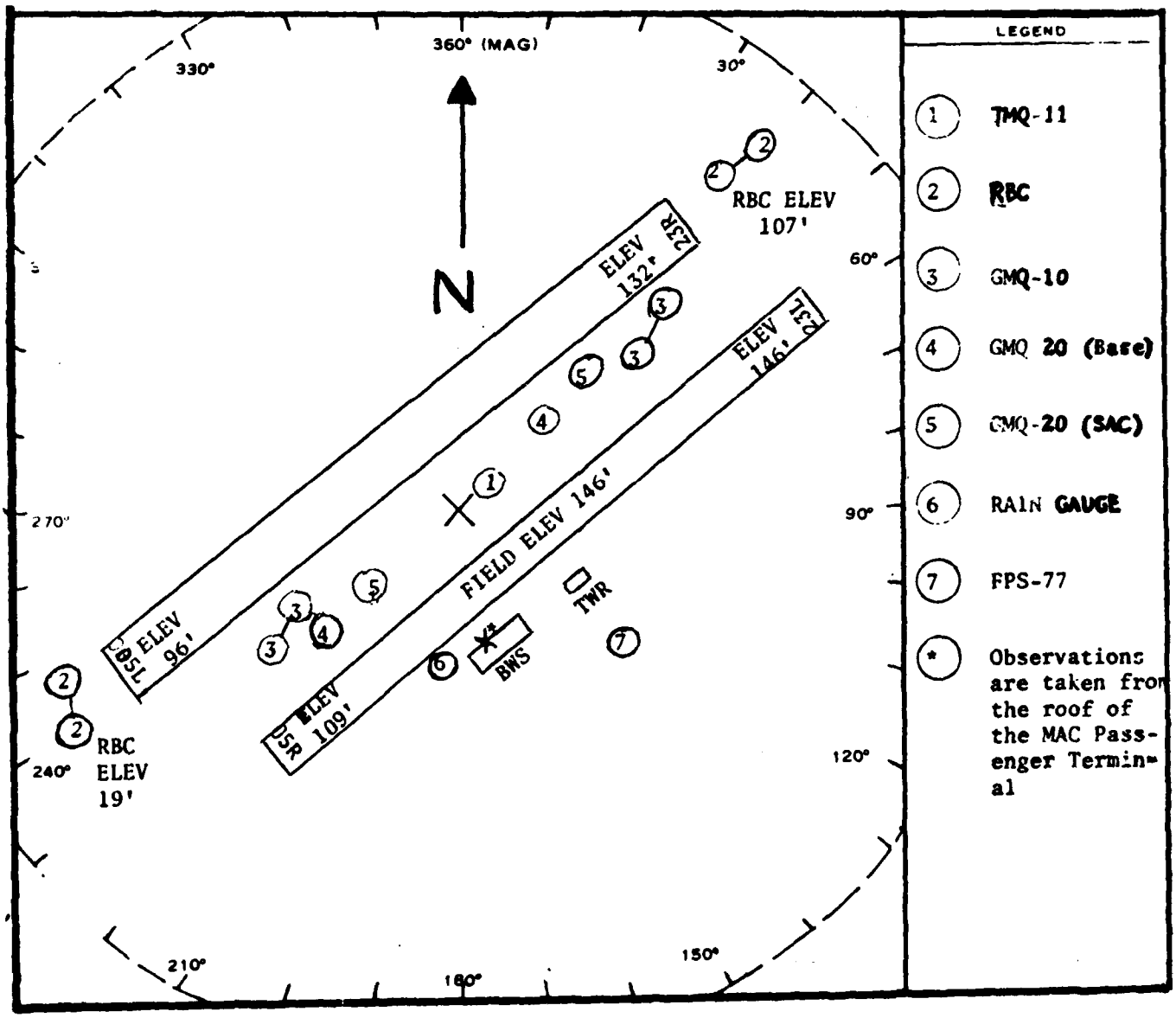
4. Data Availability.

a. Land weather observations near Kadena AB are relatively scarce. Only Kadena AB, Futenma MCAS, and Naha IAP take and report observations 24 hours per day. Seven other stations within 250 NM report hourly observations (METAR) during daytime hours. These are Ishigaki (ROIG, 47918), Miyako (ROMY, 47927), Shimoji (RORS), Kume Jima (ROKJ, 47929), Amami (RJKA, 47909), Erabu (RJKB, 47942), and Minami Daito (ROMD, 47945).

b. Naha, Amami, Ishigaki, and Minami Daito provide RAOB and PIBAL data.

c. In addition to radar observations taken at Kadena, reports (in RADOB code) are available from Ishigaki Miyako, Amami, and Naha/Itokazu (47937). Naha JASDF provides 3-hourly RAREPs at certain time of the year.

5. LOCATION OF METEOROLOGICAL EQUIPMENT



SECTION B

WEATHER IMPACT ON SUPPORTED UNITS

SECTION B

WEATHER IMPACT ON SUPPORTED UNITS

CUSTOMER OR AIRCRAFT TYPE AND CUSTOMER ACTION(S)	WEATHER CONDITION OR OCCURRENCE	THRSEHOLD VALUE
F-15/RF4/F5. Delay or cancel missions.	* NAHA CIG/VSBY	Below 1000 or 2 (Forecast or observed
RC-135/KC-135/SR-71. Delay or cancel missions, or divert to alternate.	Kadena CIG/VSBY	Below 200 or ½
SR-71. Delay or cancel mission. Diversion or evasive action is usally required by other aircraft.	Icing/Turbulence (Terminal forecast or PIREP within 100NM)	Moderate or greater
Aircraft missions. Cancelled or delayed.	Low level wind shear	Below 2000 ft
HH-53. Helicopter blades tied down.	Surface winds	30-34 kts
RF4 (Land without drag chutes), KC-135, RC-135, SR-71, and E-3A (MAX XWND 25 KTS, RCR DRY). Missions cancelled or delayed. C-141 and C-5A diverted to alternate airfields.	* Crosswind	25-29 KTS
Fuels management (all fueling terminated). 18TFG/MAC JOB CONTROLS (Stop servicing all aircraft). 18TFG ADPE/18TFG Data	Thunderstorms Within 3NM	Lightning

CUSTOMER OR AIRCRAFT TYPE AND CUSTOMER ACTION(S)	WEATHER CONDITION OR OCCURRENCE	THRESHOLD
Automation/DOD schools computers (computers shut down partially or fully).		
376SW (outdoor maintenance activities halted).		
400MMS, all activities stop.	Thunderstorms Within 5NM 400MMS	Lightning
18 CSG/CE, USAGO, 18TFG FUELS (Secure property). KC-135/RC-135 (Aircraft must be taken off jacks). 400MMS (Stop all munitions loading).	Surface winds	≥35 KTS
F-15/RF (takeoff/ Land single ship). KC135/RC-135/E3A (Maximum crosswind 15 kts, RCR WET). RF4 (Crosswind≥20 KTS RCR WET, landing unsafe).	Crosswind	15-25 KTS
SR-71 (Crosswind ≥ 20 KTS, Cancel or delay missions).		
MAC (Sends messages to aircraft to conserve fuel for alternate field).		
USAGO, Critical Comm systems may be shut and tanker POL off-loading operations may be suspended.	Thunderstorms USAGO Areas	Lightning

CUSTOMER OR AIRCRAFT TYPE AND CUSTOMER ACTION(S)	WEATHER CONDITION OR OCCURRENCE	THRESHOLD VALUE
18TFG ADPE, Changes priorities of computer runs and stand by for immediate shut-down of computer equipmnet. 400MMS, caution is exercised by all.	Thunderstorms within 25NM RODN	Lightning
F-15/T-39 (RCR DRY delay or cancel missions). RF4 (RCR DRY/≥35 KTS, delay or cancel missions).	Crosswind	≥30KTS
All customers exercise caution.	Thunderstorms TAF	

SECTION C

SYNOPTIC CLIMATOLOGY

SECTION C

SYNOPTIC CLIMATOLOGY

1. General. Okinawa experiences two principal seasons each year; summer and winter. The Kuroshio current which flows northward past Okinawa has a great influence on the climate of the island. Winters are mild and summers are warm and humid due to the ever present warm current. The weather of a particular summer or winter depends on the strength of two semi-permanent high cells, the Pacific high and the Siberian high. The polar front or polar trough divides these two air masses. Okinawa experiences southerly winds and maritime tropical air in the summer and northerly winds and continental polar (CP) air in the winter. The continental polar air is modified to a great extent due to the overwater trajectory it experiences before reaching Okinawa (this CP air must cross over the warm Kuroshio). Spring and fall are more variable in the type of weather conditions that occur and the length of the season each year, and they do not have the well defined characteristics of summer and winter. Often, upper air features are more critical to day to day forecasts than surface observations.

2. Winter. During winter the mean position of the polar front or trough is located south of Okinawa and the weather is dominated by the Siberian High. From January to March the daily weather follows a cyclic pattern of 3 to 8 days. The most significant features are trough or fronts which occur with outbreaks of the Siberian High. These develop in northern China and move rapidly southeastward to arrive at and strengten the Polar trough (fig C-1). When these outbreaks are developing, Okinawa enjous scattered low and high cloudiness and unrestricted visibility. These outbreaks are usually marked by gusty winds, towering cumulus, heavy showers, and occasional thunderstorms. The fronts usually cross the East China Sea with speeds up to 20 knots Surface winds prior to the arrival of the front are light and southerly. Immediately before the outbreak arrives, winds may swing to the southwest or west. A wind shift to the northwest or north (often 30-40 Kts) occurs with the passage of the front and is the best indicator that a fropa has occurred. It is not uncommon to have brief occurrences of ceilings of 500 ft and low visibility in heavy rain at Kadena. Generally, light precipitation starts just prior to the frontal passage and continues for less than six hours, depending on the frontal movement. Arrival of the cold front at Kadena may be hard to detect because there often appears to be two cold fronts. There may be light

brief showers that give strong radar returns with the first wind shift. The wind, after the initial gusts, become light northerly. Four to six hours later heavy showers and persistent strong gusty winds will occur. Post-outbreak weather consists of one to three days of broken to overcast stratocumulus with bases at approximately 2000 ft and tops at 6000 ft. The sky is cloudless above this layer. These low ceilings persist until the strong northerly winds (25 to 35 kts) drop in intensity and swing to the northeast. Clearing then will take place with the sky conditions returning to low scattered and high broken cirrus. This cycle soon repeats itself.

3. Spring. Spring is a transition season. This period is also known as the "Rainy Season." However, the amount, intensity, and length of the season varies greatly from year to year. Usually the amount of rain during this period is not much greater than that of summer, but the occurrence of continuous periods of rain is much more frequent. As the polar front begins to move north, minor waves develop into large cyclones. Cyclogensis often takes place off the Taiwan coast or in the Shanghai area (fig C-2). Light rain and drizzle with occasional heavy showers and thunderstorms will persist at Kadena for periods of from 6 to 36 hours with these systems. Low ceilings of stratus and fractocumulus and occasional frontal fog will accompany the rain. The weather during this period of the year can be the most difficult to forecast. During June, the rainy season reaches its peak intensity with heavy continuous rain occurring as the polar front fluctuates across Okinawa. By mid-June the front has moved north and will remain there until fall. During late spring a new forecast problem begins to occur. Early morning stratus may form on otherwise clear nights and persist until mid-morning. This layer of low (1000 ft) stratus is advected from south of Kadena and often arrives without warning. High relative humidity and southerly winds are necessary for the formation of this stratus, and pilot reports are the best source of information of its presence before it moves over Kadena.

4. Summer. Summer begins in late June when the polar front migrates to the north where it will remain until fall. The weather at Okinawa is maritime tropical in all respects. Winds are southerly and lighter than in winter, humidity is high, and most precipitation is of the showery type except during typhoons. Early morning stratus will still be a minor problem until July, but is not as persistent and with the rising temperatures of summer, soon ceases to occur. Afternoon rainshowers are the major problem. Convective cumulus build over the island around noon and reach the shower stage by early afternoon. The most likely area for development of these cumulus clouds is the hilly region north-northeast of Kadena. However, they are air mass cumulus and may develop at any location in the area. The problem is to determine whether these showers will move over the field or not. Ceilings in the showers will be near 1200 ft and the visibility 3 miles or less. Duration over the field is usually less than 20 minutes. Even with several showers in sight, prevailing visibility at Kadena will rarely drop below

5 miles. Occasionally, these showers may develop into thunderstorms but generally do not obtain typical thunderstorms characteristics even though their tops reach or exceed 30,000 feet. Summer shower activity is heaviest during the afternoon as would be expected. As the summer progresses it is common to see isolated anvil clouds along the horizon, with distant lightning visible at night. During late summer, showers are common around dawn, but are very light and brief.

5. Typhoon Season. The typhoon season for Okinawa begins in late May and lasts through Novermber. The peak months of the season are August and September. Weather in the "average" typhoon begins with light to moderate shower activity as the storm approaches. Towering cumulus and isolated cumulonimbus are common, as is a shield of cirrostratus. Nearer the center, moderate to heavy intermittent rain and heavy showers occur. Ceilings vary from 200 to 2000 feet and visibility from ½ to 5 miles (fig C-3). Near the eye of the storm, rain and blowing spray are mixed by the high winds.

6. Fall. In late September the polar front again moves back into the local area. During the fall it moves south rapidly as opposed to its slow northward movement during spring. Frontal passages are usually brief with four to six hours of light rain or drizzle. Heavy thunderstorm activity is rare. Skies clear rapidly after frontal passage, leaving scattered low and middle cloudiness with thin broken to overcast cirrus. The polar front when south of Kadena, is weak and may not have any well defined frontal characteristics. Okinawa enjoys a modified continental polar air mass which brings the best flying weather of the entire year during early fall. Typhoons occasionally threaten Okinawa until December and any extended period of low ceilings and visibility is usually associated with a tropical disturbance. Afternoon and evening towering cumulus may still form, but are isolated. Precipitation is light. This season might be called the "dry season" for Kadena other than for the infrequent tropical cyclones that raise the mean monthly precipitation totals. Surface winds are predominately out of the north and the mean speed is the highest of the year. Fall type weather continues until the Siberian High intensifies to the point where cold outbreaks begin to occur, usually in December or January.

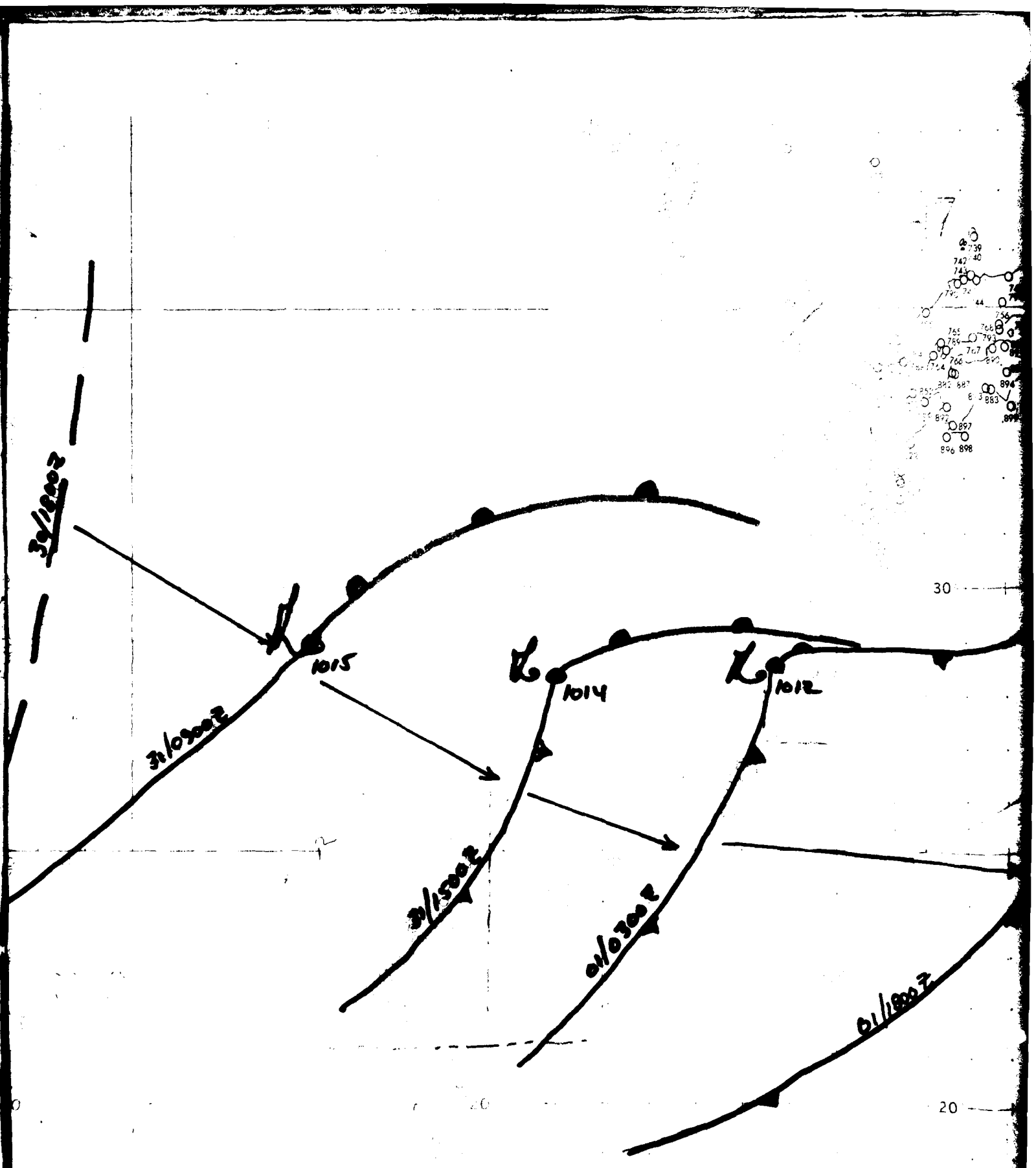
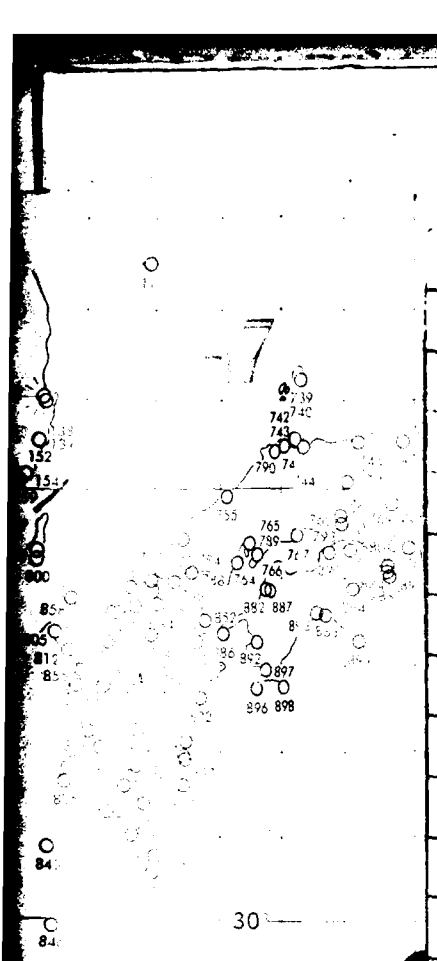
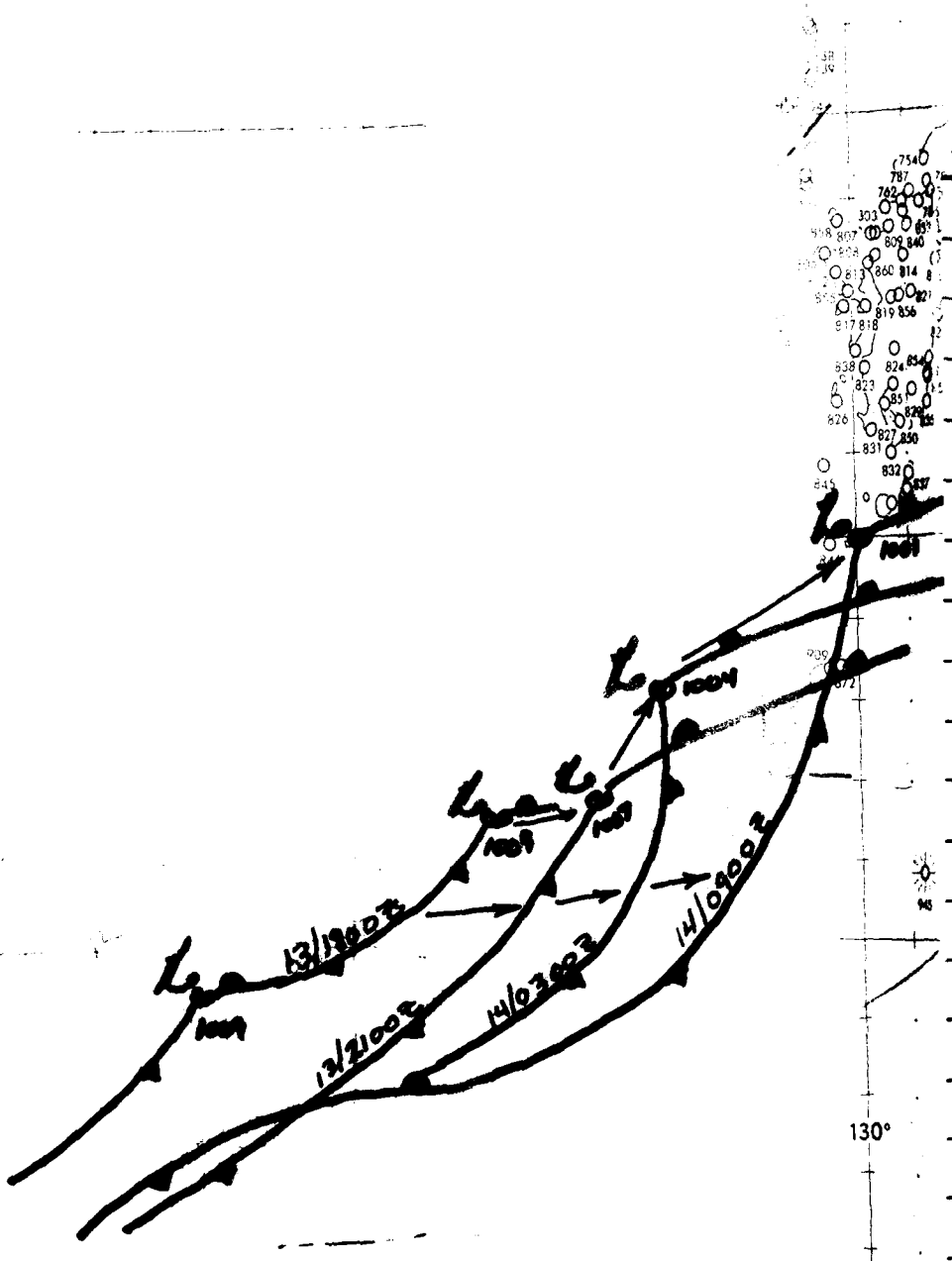


Fig C-1. Synoptic Climatology.
Winter Cold Front and associated Kadena weather.
(31 Dec 74 - 02 Jan 75)



DTG	CEILING	WIND	VSBY	WEA	TEMP(C)	TdTd(C)	ALSTG
31/00Z	020	0505	10	---	19	19	30.13
03Z	025	0813	10	---	22	19	30.08
06Z	030	VRB09	10	---	23	18	30.01
09Z	037	1105	12	---	22	19	30.03
12Z	037	1205	13	---	22	19	30.03
15Z	CIGNO	1408	13	---	21	19	29.97
18Z	CIGNO	1507	13	---	22	20	29.95
21Z	CIGNO	CALM	13	---	21	21	29.93
01/00Z	080	2110	13	---	24	22	29.96
03Z	015	3118/33	2	XXSH	21	21	29.95
06Z	090	3206	15	---	22	21	29.91
09Z	090	3409	13	---	21	19	29.97
12Z	044	3410	13	---	21	18	30.01
15Z	031	3510/15	13	---	21	17	30.04
18Z	050	3510/16	13	---	19	16	30.03
21Z	030	3512/18	13	RASH	18	16	30.06
02/00Z	015	3513/19	13	RASH	18	14	30.11
03Z	035	3411	13	---	18	12	30.10
06Z	030	3508/14	13	---	17	11	30.07
09Z	030	3612/18	12	---	17	13	30.10
12Z	044	3608	13	---	17	12	30.13
15Z	044	3609	15	---	17	11	30.13
18Z	045	3607	13	RASH	17	10	30.11
21Z	**035**	**0108/15**	**13**	**---**	**16**	**09**	**30.12**

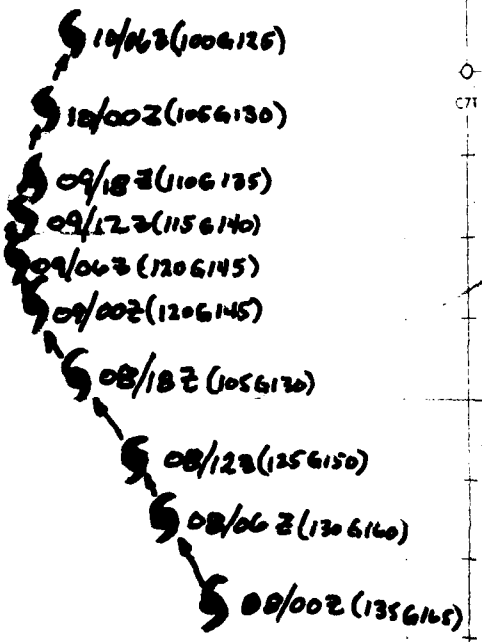


DTG	CEILING	WIND	VSBY	
13/00Z	CIGNO	0304	15	
03Z	CIGNO	0712/19	25	
06Z	CIGNO	0714/21	20	
09Z	100	0815/22	13	
12Z	070	0913/22	13	
15Z	007	1112/21	5	R
18Z	004	1408	2	R
21Z	009	1714	13	
14/00Z	010	1922/28	10	D
01Z	010	1920/26	3	R
02Z	010	2021/32	5	R
03Z	010	2020/29	5	T
04Z	010	VRB32/45	1/16	X
05Z	010	2809/14	3	R
06Z	018	2710	7	R
07Z	040	2712/17	20	R
08Z	080	2613	20	
09Z	080	2817/22	15	
10Z	080	2720/29	13	
11Z	037	2820/29	13	
12Z	080	2918/24	13	
13Z	CIGNO	VRB18/27	13	

Fig C-2. Synoptic Climatology. Taiwan Low and associated weather. (13-14 Feb 75)

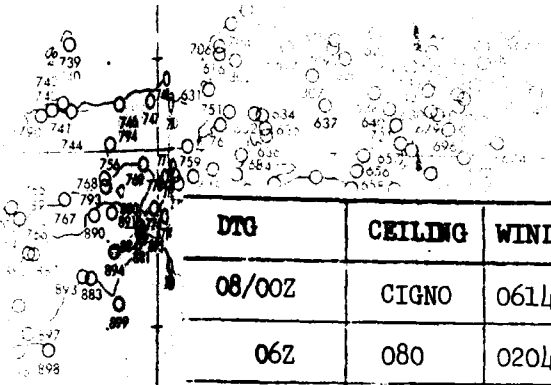
DTG	CEILING	WIND	VSBY	WEA	TEMP(C)	TdTd(C)	ALSTG	
13/00Z	CIGNO	0304	15	---	16	11	30.09	
03Z	CIGNO	0712/19	25	---	19	14	30.08	
06Z	CIGNO	0714/21	20	---	19	13	29.99	
09Z	100	0815/22	13	---	19	14	29.96	
12Z	070	0913/22	13	---	18	14	29.94	
15Z	007	1112/21	5	RA-DZ-	17	17	29.92	
18Z	004	1408	2	RADZ	18	18	29.81	
21Z	009	1714	13	---	20	19	29.75	
14/00Z	010	1922/28	10	DZ	22	21	29.70	
01Z	010	1920/26	3	RA	21	21	29.71	
02Z	010	2021/32	5	RA	22	21	29.69	
03Z	010	2020/29	5	TS RASH	22	21	29.68	
04Z	010	VRB32/45	1/16	XXRA	22	21	29.68	-X 6R///
05Z	010	2809/14	3	RA-	18	18	29.69	
06Z	018	2710	7	RA-	18	18	29.68	
07Z	040	2712/17	20	RA-				
08Z	080	2613	20	---	19	18	29.67	
09Z	080	2817/22	15	---	19	17	29.70	
10Z	080	2720/29	13	---	18	17	29.71	
11Z	037	2820/29	13	---	18	17	29.74	
12Z	080	2918/24	13	---	18	17	29.77	
13Z	CIGNO	VRB18/27	13	---	18	17	29.79	

ology.
associated
14 Feb 75)



DTG	CEILING	WIND	V
08/00Z	CIGNO	0614/20	20
06Z	080	0204/12	7
12Z	013	0106/11	7
15Z	015	0311/17	4
18Z	015	0220/28	4
21Z	021	0230/40	7
09/00Z	021	3630/50	4
03Z	009	3550/60	1
06Z	009	3346/69	1
09Z	021	3240/60	1
12Z	020	3036/53	2
15Z	020	2938/51	2
18Z	020	2834/46	3
21Z	020	2830/37	3
10/00Z	020	2724/38	3
03Z	020	2720/25	3
06Z	020	2820/28	3
09Z	020	2820/26	3
12Z	020	2916	3
15Z	020	2816	3
18Z	060	2810	3

Fig C-3. Synoptic Climatology. Typhoon Fran (Sep 1976) and associated Kadena weather.



DTG	CEILING	WIND	VSBY	WEA	TEMP(C)	TdTd(C)	QFF
08/00Z	CIGNO	0614/20	20	---	30	25	1001
06Z	080	0204/12	7	RA-	27	24	997
12Z	013	0106/11	7	RA-	28	25	995
15Z15Z	015	0311/17	4	RA-	27	24	993
18Z	015	0220/28	4	RA-	28	25	989
21Z	021	0230/40	7	RERA	29	24	986
09/00Z	021	3630/50	4	RA-	27	24	983
03Z	009	3550/60	1/16	RADZ	27	25	978
06Z	909	3346/69	1	RADZ	26	25	975
09Z	021	3240/60	1 1/2	RA-DZ-	26	26	977
12Z	020	3036/53	2	RA-DZ-	26	25	983
15Z	020	2938/51	2	RA-	26	23	985
18Z	020	2834/46	3	RA-	28	24	988
21Z	020	2830/37	7	RERA	28	24	992
10/00Z	020	2724/38	4	HZ	28	24	995
03Z	020	2720/25	5	FG	28	24	998
06Z	020	2820/28	4	FG	28	24	998
09Z	020	2820/26	3	DZ-	27	24	998
12Z	020	2916	3	RASH	27	24	1000
15Z	020	2816	7	---	27	24	1000
18Z	060	2810	7	---	27	23	1002

tic Climatology.
on Fran (Sep 1976)
ssociated Kadena
er.

SECTION D

RULES-OF-THUMB (ROTS)

RULES-OF-THUMB (ROTS)

No ROTs currently approved

SECTION E

FORECAST STUDIES

FORECAST STUDIES

No forecast studies currently approved

SECTION F

CLIMATOLOGICAL DATA

A. CLIMATIC OUTLOOK FOR JANUARY

During the month of January the Polar Front is situated well south of Okinawa over the Northern Luzon area. Okinawa's weather is dominated by the Siberian High Pressure cell over Mongolia. Cold weather "out-breaks" developing from the Siberian High are generally modified when they reach the warm waters of the East China Sea. therefore Okinawa's daily minimum temperature rarely drops below 45°F. Occasionally low pressure cells develop just south of Shanghai on the China Coast and move in an East-northeasterly direction just north of Okinawa bringing low clouds, light precipation, and gusty surface winds to the area. Sea water temperatures average 72°F and the air temperature 61°F. The contrast between these two temperatures cause low level clouds (average 3,000') and light rain-showers to develop over or near the Island.

SKY CONDITION

Average cloud cover	7.4 tenths
Frequency of VFR conditions	92.3%
Frequency of IFR conditions	5.1%
Below 1000' or 3 miles vis	2.4%
Below 200' or 1 mile vis	0.2

WEATHER

Average precipitation	4.7"
mean # dayes with trace or more	22 days
Mean from Typhoons	0
Maximum monthly	12.9"
Minimum monthly	1.1"
Maximum 24 hours	4.4"

TEMPERATURE AND HUMIDITY

Average daily	61°F
Extreme Maximum	81°F
Mean maximum	66°F
Mean minimum	55°F
Extreme minimum	37°F
Mean relative humidity	73%
Thunderstorm days	0.1
Average sea water temperature	72°F

WIND

Most frequent direction	North
Mean speed	9 Knots
Mean maximum monthly gust	19 Knots
Maximum gust	65 Knots
Average freezing level	9000'

P CLIMATIC OUTLOOK FOR FEBRUARY

As winter weather continues over Okinawa, the month of February shows that the Polar Front has reached its southern most position some 500 miles south of the Island. During the month the Siberian high reaches its maximum intensity and the daily weather follows a cyclic pattern of approximately every 3 to 8 days. Precipatation continues to be associated with cold air (warm water) stratocumulas, frontal passages, and low pressure waves that form on frontal systems after they pass Okinawa. Occasional low pressure cells that form over or near Taiwan (Taiwan lows) are also an important influence on the weather over Okinawa during February, as their favorite trajectory begins northeastward along the polar front and east of Okinawa.

SKY CONDITION

Average cloud cover	7.4 tenths
Frequency of VFR conditions	89.6%
Frequency of IFR conditions	10.4%
Below 1000' or 3 miles vis	3.3%
Below 200' or ½ mile vis	.1%

WEATHER

Average precipitation	4.3"
mean # days with trace or more	20 days
Mean from Typhoons	0
Maximum monthly	9.8"
Minimum monthly	1.3"
Maximum 24 hours	4.1"

TEMPERATURE AND HUMIDITY

Average daily	61°F
Extreme Maximum	83°F
Mean maximum	66°F
Mean minimum	56°F
Extreme minimum	37°F
Mean relative humidity	75%
Thunderstorm days	0.4 days
Average sea water temperature	71°F

WIND

Most frequent direction	North
Mean speed	9 Knots
Mean maximum monthly monthly	38 Knots
Maximum gust	66 Knots
Average freezing level	9000'

C. CLIMATIC OUTLOOK FOR MARCH

During March the Polar front begins its annual retreat northward and is situated between Luzon and Tiawan. The Siberian high starts to weaken quite rapidly and move northward. Frequent low pressure cells develop in the vicinity of Shanghai China and track toward the northeast. Cold frontal systems associated with the Shanghai lows occasionally pass through Okinawa. Low pressure cells also develop in the vicinity of Tiawan and track northeastward into the Okinawa region. Occasional low clouds, gusty surface winds and rain occur over Okinawa due to the passage of the Tiawan low and the frontal systems associated with the development of the Shanghai low.

SKY CONDITION

Average cloud cover	7.5 tenths
Frequency of VFR conditions	83.2%
Frequency of IFR conditions	16.8%
Below 1000' or 3 miles vis	5.5%
Below 200' or 1 mile vis	.3%

WEATHER

Average precipitation	4.8"
Mean # days with trace or more	20 days
Mean from Typhoons	0
Maximum monthly	11.2"
Minimum monthly	.9"
Maximum 24 hours	4.5"

TEMPERATURE AND HUMIDITY

Average daily	64°F
Extreme Maximum	82°F
Mean Maximum	70°F
Mean Minimum	59°F
Extreme Minimum	42°F
Mean relative humidity	77%
Thunderstorm days	.9
Average sea water temperature	72°F

WIND

Most frequent direction	North
Mean speed	9 knots
Mean maximum monthly gust	36 knots
Maximum gust	48 knots
Average freezing level	10,000'

D. CLIMATIC OUTLOOK FOR APRIL

During April the Siberian high pressure cell has lost its energy and no longer becomes a cold and windy weather threat to Okinawa. Polar frontal passages are few and become quasi-stationary some 120 miles south of the island. Monthly precipitation increases from 4.8 inches in march to 6.1 inches in April due to the irreregular position of the polar front and the occasional low pressure cells that develop along the front and pass near the island of Okinawa.

SKY CONDITION

Average cloud cover	7.4 tenths
Frequency of VFR conditions	73.4%
Frequency of IFR conditions	26.6%
Below 1000' or 3 miles vis	9.4%
Below 200' or 1 mile vis	.6%

WEATHER

Average precipitation	6.1"
Mean # days with trace or more	19 days
Mean from typhoons	0
Maximum monthly	15.0"
Minimum monthly	0.7"
Maximum 24 hours	4.6"

Temperature and Humidity

Average daily	70°F
Extreme Maximum	86°F
Mean Maximum	75°F
Mean Minimum	64°F
Extreme Minimum	49°F
Mean Relitive Humidity	80%
Thunderstorm days	2.1 days
Average sea water temperature	74°F

WIND

Most frequent direction	East
Mean speed	9 knots
Mean maximum monthly gust	30 knots
Maximum gust	70 knots
Average freezing level	13,000'

E. CLIMATIC OUTLOOK FOR MAY

During May the polar front is located in the vicinity of Okinawa and the onset of Okinawa's rainy season begins. Low pressure cells that develop along the polar front move through Okinawa at an average of one every four days, periods of light to moderate rain and low ceilings occur nearly each day during the rainy season. Cloud ceilings less than 1000 feet and visibility less than 2 miles occur at least 10% of the time during the month. The average air temperature is a humid 75°F and the average sea temperature jumps to 77°F. The rainy season usually lasts well into the month of June on Okinawa.

SKY CONDITION

Average cloud cover	7.8 tenths
Frequency of VFR conditions	68.3%
Frequency of IFR conditions	31.7%
Below 1000' or 3 miles vis	9.4%
Below 200' or 1 mile vis	.6%

WEATHER

Average precipation	9.2"
Mean # days with trace or more	21 days
Mean from typhoons	0.1
Maximum monthly	26.8"
Minimum monthly	.6"
Maximum 24 hours	5.6"

Temperature and Humidity

Average daily	75°F
Extreme Maximum	90°F
Mean Maximum	80°F
Mean Minimum	70°F
Extreme Minimum	55°F
Mean relative humidity	83%
Thunderstorm days	2.3 days
Average sea water temperature	77°F

WIND

Most frequent direction	East
Mean speed	8 knots
Mean maximum monthly gust	30 knots
Maximum gust	56 knots
Average freezing level	14,500'

F. CLIMATIC OUTLOOK FOR JUNE

June is the most unique month of the year as it marks the end of rainy season on Okinawa and the beginning of the Tropical cyclone season. During the month of June the Polar front continues its northward migration and assumes a mean position approximately 180 miles north of Okinawa. The rainy season continues for the first half of the month while the second half is dominated by the hot humid weather of summer. The probability of a Tropical cyclone affecting Okinawa during June is about 30%. June's Tropical cyclones usually form between Guam and the Phillipines and recurve to the north just east of Luzon affecting Taiwan, Okinawa or Southern Japan before dissipation.

SKY CONDITION

Average cloud cover	8.0 tenths
Frequency of VFR conditions	69.9%
Frequency of IFR conditions	30.1%
Below 1000' or 3 miles vis	10.2%
Below 200' or 1 mile vis	.7%

WEATHER

Average precipation	12.6"
Mean # days with trace or more	19 days
Mean from Typhoons	0.3 days
Maximum monthly	30.7"
Minimum monthly	3.5"
Maximum 24 hours	9.4"

TEMPERATURE AND HUMIDITY

Average daily	79°F
Extreme Maximum	94°F
Mean Maximum	84°F
Mean mimimum	74°F
Extreme Minimum	62°F
Mean relative humidity	85%

Thunderstorm days	3.0 days
Average sea water temperature	80.0°F

WIND

Most frequent direction	Southwest
Mean speed	9 knots
Mean maximum monthly gust	40 knots
Maximum gust	96 knots
Average freezing level	15,000'

G. CLIMATIC OUTLOOK FOR JULY

During July the Polar front has reached its summer position and is orientated east to west from mainland China, across the lower Yellow sea, through central Korea and into central Japan. It is during this month that mainland Japan has its rainy season. the Pacific high pressure cell is well developed over Okinawa and with its arrival comes the hot, humid weather wihich is predominant during the summer months on Okinawa. Tropical Cyclones during the Month of July usually form south of Guam and approximately 45% of these storms recurve toward Okinawa. There is a 35% chance that Okinawa will be affected by a Tropical Cyclone during the month.

SKY CONDITION

Average cloud cover	6.5 tenths
Frequency of VFR conditions	90%
Frequency of IFR conditions	10%
Below 1000' or 3 miles vis	2.3%
Below 200' or 1 mile vis	.2%

WEATHER

Average precipation	8.1"
Mean # days with trace or more	18 days
Mean from Typhoons	1.3"
Maximum monthly	19.5"
Minimum monthly	0.4"
Maximum 24 hours	9.0"

TEMPERATURE AND HUMIDITY

Average daily	83°F
Extreme Maximum	94°F
Mean maximum	88°F
Mean minimum	78°F
Extreme minimum	71°F
Mean relative humidity	82%

Thunderstorm days	2.5 days
Average sea water temperature	81.5°F

WIND

Most frequent direction	Southwest
Mean speed	9 knots
Mean maximum monthly gust	43 knots
Maximum gust	125 knots***
Average freezing level	16,000'

*** 23 July 1949 from Typhoon GLORIA. Eye passed 25NM southwest of Okinawa.

H. CLIMATIC OUTLOOK FOR AUGUST

August finds Okinawa completely under the influence of the Pacific High Pressure Cell and its associated southwest summer monsoon. The Inter-tropical convergence zone (ITCZ) migrates to its northern most position during August and is situated over the southern Luzon area. The combined influence of these systems make August the hottest month of the year on Okinawa. Tropical Cyclones that for during the month of August move toward the west to westnorthwest and generally recurve toward the northeast near Okinawa. There is a 40% chance that Okinawa will be affected by a Tropical Cyclone during the month of August. August is the peak month for Tropical Cyclone threats on Okinawa.

SKY CONDITION

Average cloud cover	5.2 tenths
Frequency of VFR conditions	86.3%
Frequency of IFR conditions	13.7%
Below 1000' or 3 miles vis	3.8%
Below 200' or 1 mile vis	.6%

WEATHER

Average precipatation	8.9"
Mean # days with trace or more	22 days
Mean from Typhoons	2.7 "
Maximum monthly	21.3"
Minimum monthly	3.5"
Maximum 24 hours	17.4"

Temperature and Humidity

Average daily	83.5°F
Extreme Maximum	95.0°F
Mean maximum	88.0°F
Mean minimum	78.0°F
Extreme minimum	69.0°F
Mean relative humidity	82.0%
Thunderstorm days	3.2 days
Average sea water temperature	83.0°F

WIND

Most frequent direction	East
Mean speed	9 knots
Mean maximum monthly gust	50 knots
Maximum gust	98 knots***
Average freezing level	16,000'

*** 15 August 1954 from Typhoon GRACE. Eye passed overhead on Okinawa.

I. CLIMATIC OUTLOOK FOR SEPTEMBER

September markes the last of the hot months on okinawa and is also the transition month from the southwest monsoon of summer to the northeast monsoon of winter. By the end of the month the polar front should have reached a position just south of Okinawa. September is second only to August as the month with the greatest percentage probability of a Tropical Cyclone hit, about 40%. As a matter of interest, the most severe Tropical Cyclone recorded in recent times on Okinawa was Tropical Cyclone "EMMA" which struck the Island during September of 1956. The Ryukyan Meteorological Agency registered substained winds of 100 knots during "EMMA" with a peak gust of 143 knots.

SKY CONDITION

Average cloud cover	5.7 tenths
Frequency of VFR conditions	91.8%
Frequency of IFR conditions	8.2%
Below 1000' or 3 miles vis	1.9%
Below 200' or 1 mile vis	0.3%

WEATHER

Average precipitation	7.9 inches
Mean # days with trace or more	21 days
Mean from Typhoons	3.3 inches
Maximum monthly	57.6 inches
Minimum monthly	1.6 inches
Maximum 24 hours	42.2 inches*

TEMPERATURE AND HUMIDITY

Average daily	81.0°F
Extreme maximum	92.0°F
Mean Maximum	86.0°F
Mean minimum	76.0°F
Extreme minimum	65.0°F
Mean relative humidity	81.0%

THUNDERSTORM DAYS	1.7 days
AVERAGE SEA WATER TEMPERATURE	83.0°F

WIND

Most frequent direction	East
Mean speed	8 knots
Mean maximum monthly gust	45 knots
Maximum gust	143 knots
AVERAGE FREEZING LEVEL	15,000'

* 8 September 1956 from Typhoon "EMMA" . Typhoon "EMMA" passed over Okinawa dumping 42.2 inches of rain in a 24 hour period at Kadena Air Base. Max gust of 143 knots was recorded at the Ryukyu Weather Bureau Observatory at Naha, Naha air base recorded peak gust of 112 knots while Kadena Air Base recorded 100 knots.

CLIMATIC OUTLOOK FOR OCTOBER

The month of October offers welcome relief from the summer heat of June through September. The Polar front lies south of Okinawa and Taiwan and the cooling northeast wind flow originating over central Asia and dominating the local weather picture, causes lower temperatures, humidity and precipation over the local area. There are however, two sources of adverse weather which can have a marked effect on Okinawa during October and they are: (1) Tropical Cyclones which remain threat to Okinawa with a 32% probability of a hit and: (2) Taiwan lows which were covered in Februarys climatic outlook.

SKY CONDITION

Average cover	5.9 tenths
Frequency of VFR conditions	90.4%
Frequency of IFR conditions	9.6%
Below 1000' or 3 miles vis	2.9%
Below 200' or 1 mile vis	0.5%

WEATHER

Average precipitation	6.5 inches
Mean # days with trace or more	19 days
Mean from Typhoons	3.0 days
Maximum monthly	35.2 inches
Minimum monthly	0.7 inches
Maximum 24 hours	10.2 inches

TEMPERATURE AND HUMIDITY

Average daily	76.0°F
Extreme maximum	90.0°F
Mean maximum	81.0°F
Mean minimum	70.0°F
Extreme minimum	54.0°F
Mean relative humidity	76.0%

THUNDERSTORM DAYS	0.9 days
AVERAGE SEA WATER TEMPERATURE	80.0°F

WIND

Most frequent direction	Northeast
Mean speed	10 knots
Mean maximum monthly gust	43 knots
Maximum gust	109 knots*

AVERAGE FREEZING LEVEL	14,000'

* 14 October 1951 Typhoon "RUTH". Eye passed 30NM west of OKINAWA.

K. CLIMATIC OUTLOOK FOR NOVEMBER

During the month of November, the Siberian High pressure cell continues to build over central Asia, bringing the first snow to Northern Japan and pushing the Polar front further south toward its mean winter position across Northern Luzon Island in the northern Phillippines. The front is still relatively weak and stable during November with little low pressure wave action. Okinawa can expect from 4 to 8 frontal passages during the month with accompanying shower activity and isolated thunderstorms. The primary feature of these frontal passages is the strong northerly winds that normally follow the actual frontal passage. These winds which occasionally gusts from 25 to 35 knots, usually prevail for periods up to 48 hours. Tropical Cyclones occur during November with a hit probability of 25% for Okinawa.

SKY CONDITION

Average cloud cover	6.6 tenths
Frequency of VFR conditions	88.8%
Frequency of IFR conditions	11.2%
Below 1000' or 3 miles vis	3.4%
Below 200' or 1 mile vis	.2%

WEATHER

Average precipitation	5.4 inches
Mean # days with trace or more	20 days
Mean from Typhoons	1.2 inches
Maximum monthly	16.5 inches
Minimum monthly	1.7 inches
Maximum 24 hours	9.2 inches

TEMPERATURE AND HUMIDITY

Average daily	70.0°F
Extreme maximum	86.0°F
Mean maximum	75.0°F
Mean minimum	65.0°F
Extreme minimum	52.0°F
Mean relative humidity	75.0%

THUNDERSTORM DAYS	0.3 days
AVERAGE SEA WATER TEMPERATURE	77.0°F

WIND

Most frequent direction	Northeast
Mean speed	10 knots
Mean maximum monthly gust	46 knots
Maximum gust	102 knots*
AVERAGE FREEZING LEVEL	13,000'

* 11 November 1950 Typhoon "CLARA" Eye passed 50NM Northwest of Okinawa.

K. CLIMATIC OUTLOOK FOR DECEMBER

During the month of December, the Polar front has reached the southern limits of its seasonal migration, The front lies east/west across Laos, North Viet Nan and Northern Luzon in the Phillippines. With the Siberian High Pressure Cell dominating the local weather, prevailing winds are out of the north quadrants causing temperatures to remain mild and relative humidity to remain below the yearly average of 79%. Most of the cloudiness in the Okinawa region during December is of the stratocumulus type due to the flow of cold air from Mongolia transported over the warmer waters of the Western Pacific Ocean. This cold air is modified in the lower layers by the warmer waters which in turn produces a shallow layer of stratocumulus behind the front. Typhoons are not a threat to Okinawa during December.

SKY CONDITION

Average Cloud Cover	7.0 tenths
Frequency of VFR conditions	91.9%
Frequency of IFR conditions	8.1%
Below 1000' or 3 miles vis	2.8%
Below 200' or 1 mile vis	.1%

WEATHER

Average precipitation	5.1 inches
Mean # days with trace or more	21 days
Mean from Typhoons	0
Maximum monthly	13.2 inches
Minimum monthly	0.9 inch
Maximum 24 hours	9.1 inches

TEMPERATURE AND HUMIDITY

Average daily	64.0°F
Extreme maximum	81.0°F
Mean maximum	69.0°F
Mean minimum	59.0°F
Extreme minimum	42.0°F
Mean relative humidity	74.0%

THUNDERSTORM DAYS	0.2 days
AVERAGE SEA WATER TEMPERATURE	74.0°F

WIND

Most frequent direction	Northeast
Mean speed	9 knots
Mean maximum monthly gust	34 knots
Maximum gust	45 knots
AVERAGE FREEZING LEVEL	11,000'

L. CLIMATIC TOTALS FOR THE YEAR

SKY CONDITION

Yearly average cloud cover	7.0 tenths
Average yearly VFR conditions	84.7%
Average yearly IFR conditions	15.3%
Average yearly below 1000' and 3 miles vis	5.0%
Average yearly below 200' and 1 mile vis	0.4%

WEATHER

Yearly average precipitation	83.6" TOT 6.
Yearly mean # days with trace or more	242 days
Yearly mean from Typhoons	11.6"
Yearly maximum monthly	22.49" AVG
Yearly minimum monthly	1.41" AVG
Average maximum for 24 hour period	10.81" AVG

TEMPERATURE AND HUMIDITY

Average daily for year	72.0°F AVG
Extreme maximum for year	87.1°F AVG
Extreme minimum for year	52.1°F AVG
Mean maximum for year	77.0°F AVG
Mean minimum for year	67.0°F AVG
Average relative humidity	78.0% AVG

MAX YEARLY THUNDERSTORM DAYS	18.1 days
YEARLY AVERAGE SEA WATER TEMPERATURE	77.1°F AVG

WIND

YEARLY AVERAGE DIRECTION	East
YEARLY AVERAGE WIND SPEED	9 knots
YEARLY AVERAGE MEAN MAXIMUM MONTHLY GUST	39 knots
MAXIMUM GUST	85 knots AVG
YEARLY AVERAGE FREEZING LEVEL	12,95[illegible] AVG

SECTION G

SYNOPTIC CASE STUDIES

SYNOPTIC CASE STUDIES

Det 8 case studies are filed in a separate binder

SECTION H

TERMINAL FORECAST WORK/PREPARATION SHEET

KADENA AWS TAF WORK SHEET

Date/Time(Z)_____ Forecaster_____

A. Synoptic Features/Analysis

1. Latest Sfc OBS:_____ 3 HR Trend: Up/STEADY/DOWN
2. Latest RADAR OBS:_____
3. Latest SATEL PIX:_____
4. Latest Sfc Anal(AXXN/LAWC) at _____Z:_____
5. Latest UA Anal Pkg at_____Z:_____
6. Tropical Cyclone to influence RODN w/in next 36 hours? Yes/No. Name/#:_____
   Current TCCOR: III/II/I/IC/IE. WDPN required? Yes/No. Does WDPN agree with TAF? Yes/No. If no, explain in forecast discussion section.
7. Stability Index: SSI:_____. TT:_____/K:_____.

B. Prognostic Charts/Aids/Forecast Studies/Rules of Thumb

1. Latest Sfc Progs (FXXN/FSXN):_____
2. Latest FAXN(MWA):_____
3. Latest UA Progs:_____
4. Vorticity Advection: PAS/NEUTRAL/NEG
5. Test ROT. Name_____. Forecast effect on RODN:_____
6. Test Fcst Study. Name_____. Forecast effect on RODN:_____

C. Forecast Discussion_____

D. Kadena Terminal Forecast

RODN_____

T/O DATA (FIRST 12 HRS OF FCST): TEMP(F/C)____ PA(+/-)____ MIN QNH____

1. MWA CRITERIA FIRST 6 HRS OF FCST? Yes/No. TS/CIG/VIS/TURB/ICE/XWND/WIND/SHEAR
2. Dissemination: E/W____ TTY____ DISPLAY____ ATAD____
3. Forecast AMD Required? Yes/No/ issued at_____Z. Reason_____
4. Verification/Time

	3RD HR Z	6TH HR Z	12HR Z	24HR Z
CC Fcst CAT:				
Persistence:				
Stn Fcst CAT:				
Stn Obsvd CAT:				
Skill Score:				

E. Bust Review Required? Yes/No. Reason_____. Due Date_____.

KADENA BWS TAF AMD WORKSHEET

DARE/TIME (Z)_____ (BTF/ATF) FORECASTER_____

RODN AMD_____

T/O DATA(FIRST 12HRS OF FCST): TEMP(F/C)____ PA(+/-)____ MIN QNH_____
MWA CRITERIA FIRST 6HRS OF FCST? YES/NO. TS/CIG/VIS/TURB/ICE/XWND/SHEAR
DISSEMINATION: E/W____ TTY____ ATAD____ DISPLAY____ OTHER_____
REASON FOR AMD: 1. CIG (AT OR ABV/BLO: 3000/1500/1000/200; 2. VIS (AT OR ABV/BLO: 3/2/ 1/2) 3. PRECIP (START/STOP); 4. ALSTG .05INS IN ERROR; 5. MOD OR GTR TURB; 6. MOD OR GTR ICE; 7. WINDS; 8. OTHER_____

AMD FORECAST DISCUSSION_____

T/O DATA(FIRST 12HRS OF FCST): TEMP(F/C)____ PA(+/-)____ MIN QNH_____
MWA CRITERIA FIRST 6HRS OF FCST? Yes/No. TS/CIG/VIS/TURB/ICE/XWND/WND/SHEAR
DISSEMINATION: E/W____ TTY____ ATAD____ DISPLAY____ OTHER_____
REASON FOR AMD: 1. CIG (AT OR ABV/BLO): 3000/1500/1000/200; 2. VIS (AT OR ABV/BLO: 3/2 1/2) 3. PRECIP (START/STOP); 4/ ALSTG .05INS IN ERROR; 5. MOD OR GTR TURB; 6. MOD OR GTR ICE; 7. WINDS; 8. OTHER_____

AMD FORECAST DISCUSSION_____

BUST REVIEW FORECASTER_____